AN EMPIRICAL ANALYSIS OF POVERTY-GROWTH-INEQUALITY LINKAGE IN NIGERIA

Evelyn Nwamaka Ogbeide-Osaretin

Department of Economics, Edo University, Iyamoh, Edo State

ABSTRACT

The issue of poverty is posing serious threat to the development of Nigeria economy. Poverty growth and income inequality have received much attention among scholars both on Nigeria and other economies of the world. Nevertheless, the existence of a causal relationship and the direction of causality among poverty growth and inequality have received little attention especially for Nigeria. Therefore, this study investigates the poverty-growth-inequality linkage to ascertain the existence and direction of causality in Nigeria and the possibility of a long-run relationship. Using data from a five-year round panel framework, inequality was found to be positively significantly related with poverty while growth had a negative insignificant relationship with poverty at 5 per cent level of significance. Also, there exist a long-run relationship between poverty growth and inequality. The causality triangle flows from growth causing income inequality, inequality causing poverty and growth increasing in Nigeria. The result show that there is a long-run bi-directional causality between growth and inequality, inequality causing poverty while there was no evidence of causality between growth and poverty. The study recommended among other the reduction of the inequality gap through channels such as improved taxation policies, employment and human capital development through education.

Keywords: Causality, Growth, income Inequality, Linkage, Poverty

JEL Classification: C23, C33, I31, I32

CONTRIBUTION/ ORIGINALITY

This existing literature on poverty, growth and inequality is contributed to by this study by using a panel framework in analysing the causal flow in the linkage among the variables to determine which is the target variable for sustainable development achievement in Nigeria. It also adopted the use of recent panel co-integration, error correction and causality test methods in the study.

The main finding showed that inequality should be the major target towards successful reduction of poverty and enhancing sustainable development in Nigeria.

INTRODUCTION

Poverty reduction is one of the major concerns of the world economy. Poverty makes the individual live without fundamental freedoms of action and choices (Todaro and Smith 2009). Although global poverty level has fallen in the recent decades raising global hope that poverty will soon be eradicated, yet World Bank (2016) estimated that about 800million people (10.9 percent) of the 7.3billion are still living below the $1.90 poverty line and this fall has however not been even across continents and countries. Sub-Sahara Africa countries have had rising poverty over the past decades having the highest levels of poverty and income inequality (United Nation Development (UNDP) Report in the Human Development Report (HDR), 2015).

Poverty situation in Nigeria is of a major interest giving the large amount of both natural and human resources. Nigeria is among the poorest countries in the world. While various poverty reduction strategies have been implemented over the years (National Poverty Eradication Programme (NAPEP), National Economic Empowerment Development Strategies (NEEDS) and Subsidy Reinvestment and Empowerment Program (SURE-P)), the poverty rate still remain high. About 70 percent are absolutely poor, 112.47 million people lives below the poverty line of US$ 1 per day while on self-assessment, 93.9 percent (153 million) are poor (UNDP HDR, 2015); National Bureau of Statistics (NBS) 2012). UNDP (2015) observed that multidimensional poverty was 53.2percent in 2014. NBS also revealed that although, there was a decrease in poverty level from 46 per cent in 1985 to 42 per cent in 1992 and from 65.6 percent to 54.4 percent, yet the incidence of poverty increased by 5 million between 1985 and 1992; and by 1 million between 1996 and 2004. Thus a reduction in relative poverty does not necessarily mean a fall of the population in poor as seen in figure 1.

Figure 1: Poverty rate and population in poverty in Nigeria
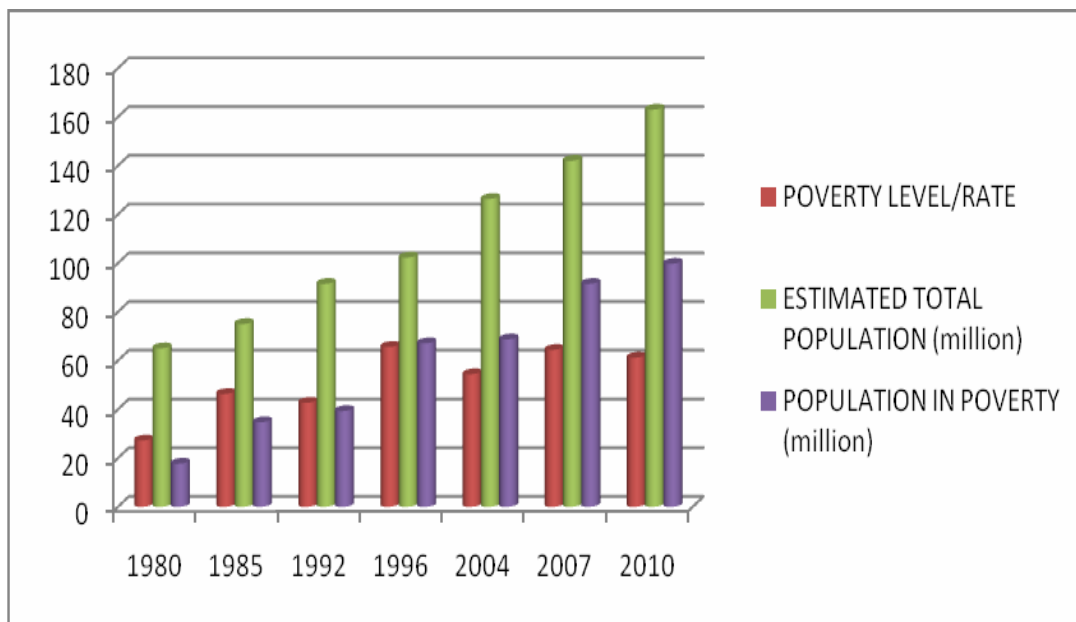
An analysis of poverty at the urban and rural areas also indicates that poverty in Nigeria is largely a rural phenomenon. NBS (2012) for example showed that, in 2010, 52.4 percent and 66.3 percent were poor in the urban and rural areas respectively. The marginalization of the rural areas through urban-biased development policies can largely be responsible for the high poverty incidence in the rural areas. Regional dimension of poverty showed that poverty is higher in the northern zones than the south. While the South-West had an incidence of poverty of 49.8, the North-East had a poverty incidence of 69.3 in 2010. Jigawa state in North-West was found to have rural poverty as much as four times the rate of Oyo state in South-West in a study carried out by World Bank. Poverty gap was 0.0996 in the South East and 0.274.3 in the North East while the severity of poverty was 0.0455 in South-East and 0.1434 in the North-East in 2004 (as shown in figure 2).

**Figure 2: Incidence of Poverty in Nigeria by Zone and Residential
Area for the year (1980 2010) (%)**
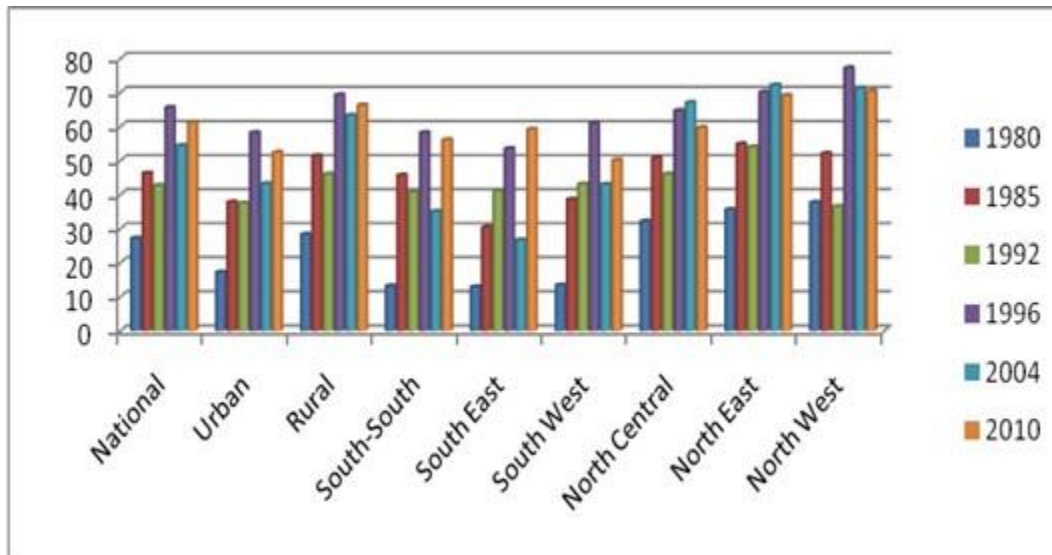
The occupational dimension of poverty incidence also shows that the agricultural sector is most affected. Over 67 percent of the extremely poor were in this sector in 2004, against about 31 percent in 1985. This poses a very crucial challenge for poverty reduction because Agriculture is a major employer of labour of the rural area where poverty incidence is high in Nigeria.

In addition to the high poverty incidence, data showed that the distribution of income has not been encouraging. For example, in 1994, the distribution of aggregate household income showed that the bottom 40 percent of the Nigeria population received only 12.9 percent of income while the top 20 percent received 49.3 percent of total household income. More conspicuous is that in 2006/2007, while the lowest 10 percent had 2 percent of the total income, the top 10 per cent had a share of 32.4 per cent. The ratio of the richest 10 percent to poorest 10 percent in Nigeria stand at 16.3 percent and the Inequality Index measured by Gini Index rose continuously from 0.387 in 1985 to, 0.58 in 2007, but fell to 0.43 in 2014 (UNDP, 2015, NBS, 2012). The higher level of inequality in the rural area than the urban shows the uniqueness of Nigeria situation contrary to what is common. Rural inequality coefficient of 0.4239 was recorded in 2004 while the urban areas were 0.4154. The disparity in inequality is also obvious in the regions as in the case of poverty. For instance, Taraba and Yobe have the highest level of inequality of 0.5241 and 0.523 respectively while Bayelsa had inequality of 0.337 in 2010.

In the face of this rising poverty and inequality, economic growth measured in GDP has also been on the rise. Nigeria's GDP was US $60.6bn in 1980, increased to US $160.7bn in 2005 and

further to US$264.2bn in 2013 with a world ranking of 37. An annual real GDP growth rate of 7.1 per cent between 2000 and 2007 and 7.44 percent in 2014 after the rebasing of GDP while per capita growth rate was on an average of 5 percent since 2000 (Ogbeide-Osaretin, Edeme & Ifelunini, (2016); World Bank, (2015), although, the country started experiencing recession in 2016. The mean per capita expenditure (in 1985 price) rose from N15.8 in 1985 to N1201.05 in 2004, N2391.4 in 2010 and N6349.56 in 2015 (Anyanwu, 1997, CBN, 2015). About 37 percent of under-five yeas old children are stunted in growth; about 10 million school age children are out of schools while youth unemployment is as high as 42.2 percent in 2016 (NBS, 2016).

Before now, increase in economic growth has been focused on as the main policy for poverty reduction. However, the link between poverty and growth is diverse and an understanding of this intricate diversity has been a major area of research in recent times. Objections have been raised about the trickle down of economic growth to the poor, reducing poverty. The assumed negative growth poverty relationship has not held in many developing countries. Hence emphasis has been shifted to the role of inequality. This raised a major debate on the professed trade-off between growth and inequality according to Kuznet's inverted U-hypothesis.

While several studies have been carried out on poverty, growth and inequality, some have reached the conclusion that there is no deliberate and regular link between increase in growth and reduction in poverty (Deininger & Squire, 1998; Fosu, 2009) others show that per capita income growth is positively related to poverty reduction (Dollar & Kraay, 2002) and others have shown that inequality plays significant role in the poverty-growth-inequality relationship (Kalwij & Verschoor, 2007, Agyemang, 2014). These contradictory results have led researchers to conclude that the growth and inequality's impact on poverty and growth may differ based on the economic setting. In Nigeria, Aigbokhan (2000) found that there is no existence of trickle down, Ichoku Agu & Ataguba (2012) concluded that growth in Nigeria is not pro-poor while Canagarajah, Ngwafon & Thomas (1997) observed that past policies of poverty reduction have been productive.

Hence, it can be inferred that the findings on poverty-growth nexus remains inconclusive and cannot be generalized. The different methods of evaluating poverty and growth may contribute to the inconsistency in past result and with the presence of inequality, the linkage becomes more complicated. But as argued by Boccanfuso & Kaboré, (2004), the use of real per capita expenditures can mitigate conclusions on poverty trends, inequality and growth relationship. Furthermore, previous studies have concentrated on just analyzing the relationship among growth, inequality and poverty (e.g. Agyemang, 2014), the question of existence of causal relationship among these variables and the direction of the causality in a panel data framework has received less attention, especially for African countries and particularly for Nigeria.

Correlation is not causation, and there is no indication about which way the causation may work. Thus, as stated by Streeten (1980), growth is not an end itself, but simply an indicator of development painting a very rosy picture of an economy outwardly but hides information on social indicators relevant to poverty. It is thus a paramount need not just to examine the relations among poverty, growth and inequality, but also, to determine the possibility of the existence of causality among the variables. This, in part, is what this work intends to do. Furthermore, an investigation of the existence of a long run relationship among the variables has not been considered so that long-term poverty reduction policy measures can be adopted since specifically poverty tends to be dynastic.

This study is thus guided by the research question to ascertain if there is any existence of causality among poverty, growth and inequality? If present, what are the nature and the flow of the causality? Is there any existence of long run relationship between poverty on the one hand and growth and inequality on the other hand? Knowledge of the flow of the causality will help policy makers to develop appropriate policies that will tackle the problem that seems un-surmountable. This study deviated especially from the studies on the subject in Nigeria by evaluating growth using real per capita expenditures and considering all possible significant simultaneous causal relations among these three variables by pairs using recent survey data and recent causality methods developed for panel data (Bangake and Eggoh, 2009; Gries & Redlin 2010).

THEORETICAL LITERATURE REVIEW

The general economic theory had been that there exist an inverse relationship between growth and poverty levels and this will by chance lead to a decline in income inequality (Feldstein, 1998). Theoretical evidence suggests that poverty could hamper sustained growth. According to Nabli, (2013), it is estimated that 10 percent increase in poverty levels, other things being equal, will lower the growth rate by one percent and reduce investment by up to eight percent of GDP. An increase in GDP reflects increase in output of goods and services. This is believed to alleviate poverty through creation of employment, increase in income and per capita expenditure. This is well expressed in Roswton's growth theory that postulates the gradual elimination of poverty within the societies as the economies grow. The above assumes that growth alone is good for poverty reduction.

Theory also posits a positive relationship between poverty and inequality. Burtless & Smeeding (2002) noted that poverty is bound to be present anywhere inequality is present as a result of their linkage. The debate on the link between poverty and inequality are of two schools. One school believes that inequality leads to poverty since it is harmful to growth while the other

school argues that inequality is a type of poverty. But in all, inequality seems to be positively related to poverty.

On the relationship between inequality and growth, there seems to be contradictions. However, as put forth by Kuznet (1955), income inequality would change as economic growth changes. The theory insists that high income inequality is a necessary condition for generation of economic growth. This was generally accepted up to early 1980s and in line with the neoclassical counter-revolution. Thus, poverty and inequality were no more problems to the society (Todaro & Smith 2009).

In addition, the Classical economic theories posit a positive relationship between growth and inequality. Kaldor (1956) in Garbis (2005) argued that there is a higher marginal propensity to save among the rich than the poor. Thus a higher degree of initial income inequality will yield higher aggregate savings, capital accumulation, and growth (Obwona, 2006). However, Kuztnet warned that there are no guarantees that the higher income groups will save a significant proportion of their income in their own country (developing countries).

Hence, there seems to be a general notion that inequality enhances growth and in the presence of growth, inequality is present showing a feedback relationship between inequality and growth. Feldstein (1998) opined that Pareto optimality will still hold if income inequality increases in the presence of growth since nobody is made worse off even when some do not benefit from growth and there is increase in poverty. But, growth may be lowered with higher initial inequality and poverty reduction may be small or even increase even in the face of growth. Thus, increasing inequality can retard growth and having positive effects on poverty reduction both in the short and long-run. Thus growth, income distribution and poverty reduction is linked in an arithmetic equation. Bourguignon (2004) illustrated this with the Poverty-Growth-Inequality (PGI) triangle. The PGI triangle showed that it is important to consider growth and income distribution simultaneously in the pursuit of poverty reduction. The level of poverty and inequality do not just depend on a nation's growth process but also on the nature of the growth, political and institutional arrangements in the distribution of the income.

EMPIRICAL LITERATURE REVIEW

Since the early 1980s, several studies on the relationship between poverty, inequality and economic growth have been carried out. N'zue & N'guessan (2006) shed light on the causal links between corruption and growth on the one hand and between poverty and growth on the panel data of 18 African countries for the period 1996-2001. Also, it looked at the causes of growth being the combined effect of corruption and poverty. Result shows that poverty causes growth

and bi-directional causality between growth and corruption. Inequality was found to cause corruption and growth was also found to cause inequality.

A study on the dynamics of growth, inequality and poverty in a GMM method of estimation was examined by Gries & Redlin (2010) on an error correction model (ECM), s in a panel of 114 developing countries and 6 regional sub-panels for 1981-2005. A short-run and long-run relationship was found among the variables. The findings reveal positive bi-directional causality between growth and inequality as well as between inequality and poverty, and negative bi-directional causality between growth and poverty.

While Khan, Khan, Zaman, Hassan & Umar (2014) focused on the growth-inequality poverty triangle in the long run on 138 countries household survey for the period 2005-2010. Poverty was measured using headcount index, inequality measured using Watts and Gini index while growth measured using per capita income. Adopting the principle component approach, it was found that poverty is increased by income inequality while growth brings reduction in poverty. Sembene (2015) analyzed the relationship among poverty growth and inequality in Sub-Saharan Africa countries. The findings revealed that despite the high rate of growth witnessed in the countries, inequality is high with only the top quintile benefiting from the growth and poverty has not been reduced.

For studies carried out in Nigeria, Bello & Roslan (2010) examined the poverty situation in Nigeria in the face of rising economic growth and millennium development goals (MDGs) expenditure. They adopted a panel data analysis on 1992 and 2004 data set from the National Consumer Survey (NCS) and National Living Standard Survey (NLSS). They employed the pooled model, fixed-effects, random-effects and weighted least square methods of estimation. The result showed a unit increase in per capita GDP led to 0.6 % increase in poverty and, a unit increase in MDG expenditure led to 11.5 increases in relative poverty. Thus, implying that economic growth and MDG spending has not really reduced poverty for the period of study.

On their part, Ichoku, et al (2012) investigated the pro-poorness of income growth in Nigeria using 1996 and 2004 nationally representative data and found that income growth was not pro-poor due to the un-suitable redistribution of income. Household size was found to be one of the critical determinants of poverty levels and poverty was worst in the agricultural sector. They recommended the adoption of smaller family size among other policies towards poverty reduction in Nigeria. In addition, Kolawole, Omobitan & Yaqub (2015) analyzed the relationship among growth poverty and inequality in Nigeria employing the OLS on time series data of GDP growth rate, income per capita, among others for the period 1990 to 2012. Results showed that inequality increases with GDP growth although poverty was reduced. They thus recommended

effective government expenditure on the educational and health sector for poverty and inequality reduction.

These past empirical works have looked at the relationship between growth and poverty reduction, on the one hand and between growth and inequality on the other hand. Little or no consideration has been made on the causal link among the three variables or the pairs of two of the variables particularly for Nigeria. Contradictory findings from these past studies as a result of countries oddness, different samples and econometric techniques as well as different measures of poverty and growth have not helped in the understanding of the link among these variables.

DATA AND METHODOLOGY

The study used semi-macro panel datasets Poverty rate was measured by head count index, Growth proxied by real per capita expenditure and Inequality captured by Gini coefficient. Data on poverty head count and Gini were generated from the National Consumer Survey (NCS) 1985 and 1992 surveys, the 1996 General Household Survey (GHS), 2003/2004 National Living Standard Survey (NLSS) and the Harmonized Nigeria Living Standard Survey (HNLSS) 2009/2010 survey as published in the National Bureau of Statistics (NBS) for the various years (this the latest household survey disaggregated in states). The HNLSS 2009/2010 is a broader scope of the NCS and a continuation of 2003/2004 NLSS. Gini data for 1985 and 1992 were sourced from Aigbokhan (2000). This is generally accepted as it has appeared in the world income inequality database. Data generation for real per capita expenditure involved the extraction of the total expenditures for each state from the Accountant Generals' Report of all the states and Central Bank of Nigeria Annual Report and Statement of Account. This was divided by the state population of the states and all converted to real terms (in 2004 prices) based on the consumer price indices (CPIs) available from the NBS. The population data was obtained from NBS base on 1991 and 2006 population census conducted by the national population commission. The thirty-six states and Abuja constituted the cross-sectional scope while the period 1985, 1992, 1996, 2004 and 2010 formed the time series scope. The quantitative estimation was done using E-views 9.0 version of the econometric software and Gretl 1.9.8 application.

MODEL SPECIFICATION

A panel data model takes the general form of $y_{it} = \alpha_{it} + \beta_i X_{it} + \mu_{it}$ ....(1)

$\mu_{it} = \mu_i + v_t + \varepsilon_{i,t}$,… ....(2)

where y_{it} is the dependent variable, and α_{it}, β_i and X_{it} are k-vectors of non-constant regressorsand parameters for i =1, 2, …, n cross-sectional units (here states) and t =1, 2 … T. time series unit*;* μ_{it} is a general disturbance, which can be a country, state or region specific unobservable effect μ_i, a time specific factor v_t, and an idiosyncratic disturbance ε_{it}. The fixed effects μ_i act as proxy for other determinants of a state's steady state not included in X_{it} and the time specific factor v_t controls for shocks common to all states. In analyzing the direction of the causal links among the variables, we built on Bangake & Eggoh (2009) and Gries & Redlin (2010) model and estimated a multivariate panel causality tests. Following literatures, we used vector error correction model (VECM) with an error correction which is in tandem with Holtz-Eakin et al. (1988, 1989) in Lau, Chye & Choong (2011). The panel VECM approach was adopted because it is flexible and allows heterogeneous panels to be used. It also corrects serial correlation and heteroschedastic standard errors. The following three equations were estimated.

$$\Delta ry_{it}= \beta_1+\sum_{j=1}^{n}\varphi_{1j}\Delta ry_{it-j}+\sum_{j=1}^{n}\alpha_{1j}\Delta ineq_{it-j}+\sum_{j=1}^{n} \lambda_{1j}\Delta pov_{it-j}+ E_{1it}+ e_{1it}\ldots\ldots\ldots\ldots(3)$$

$$\Delta ineq_{it}= \beta_2+ \sum_{j=1}^{n}\varphi_{1j}\Delta ineq_{it-j}+\sum_{j=1}^{n}\alpha_{2j}\Delta ry_{it-j}+\sum_{j=1}^{n}\lambda_{2j}\Delta pov_{it-j}+E_{2it} + e_{2it}\ldots\ldots\ldots(4)$$

$$\Delta pov_{it} = \beta_2+\sum_{j=1}^{n} \varphi_{3j}\Delta pov_{it-j}+\sum_{j=1}^{n}\alpha_{3j}\Delta ry_{it-j}+\sum_{j=1}^{n}\lambda_{3j}\Delta ineq_{it-j}+ E_{3it} + e_{3it}\ldots\ldots\ldots(5)$$

Here, E_{1it}, E_{2it} and E_{3it} are the combined time series and cross-sectional error component. ry_{it} is real growth per capita, pov_{it} is poverty head count, $ineq_{it}$ is income inequality while Δ is first difference operator. Testing for causality involves testing the statistical significance of the lagged cointegrating vectors. The direction of the short-run causality is shown by the coefficients of the parameters in the equation while the significance was tested using the t-test of the VECM estimates or Wald chi^2 of the explanatory variables. The null hypothesis is no causality and the significance of the error terms takes care of the long-run causality.

ESTIMATION PROCEDURE

Testing for integration: We used the Maddala & Wu (1999) panel unit root test, because they are highly preferred than others (Im, Pesaran, & Shin, (2003)) which are less restrictive and suffer from small sample bais. Christopher & Tsionas, (2004) noted that the MW test is advantageous over the IPS because its value does not depend on different lag lengths in the individual ADF regression. Furthermore, while the IPS test combines the test statistics, the

Fisher-type test combines the significance levels of the different tests even though both tests combine information based on individual unit root tests. This study adopts the standardized statistics by Choi (2001) that can accommodate higher values of N and this is given as:

$$Z_{MN}= \frac{\sqrt{N}\ \{N^{-1}\lambda - E\ [-2\ln(\pi_i)]\}}{\sqrt{\text{var}[-2\ln(\pi_i)}} \quad ....(6)$$

Under the null hypothesis of a unit root $E[-2\ln(\pi_i)]=2$ and var $[-2\ln(\pi_i)]=4$. If the p-values are independent and identically distributed, the Z_{MW} statistics converges to $N(0,1)$ under null hypothesis when $N \rightarrow \infty$ (Bangake & Eggoh, 2009)

Panel Cointegration Tests: The presence of our variables being integrated of order one I(1) allowed the pairwise cointegration test applying Pedroni's panel cointegration test methodology. This takes into consideration heterogeneity using specific parameters. Heterogeneous panels are investigated where the heterogeneous slope coefficients, fixed effects, and individual specific deterministic trends are permitted. This is advantageous because it is unrealistic to assume that the vectors of cointegration are identical for the panel.

To carry out the Pedroni's cointegration test we estimated first the long run relationship:

$$y_{it} = \beta_0 it + \beta_{1it}X_{1it} + \beta_{2i}X_{2it} + ... \beta_M X_{Mit} + \varepsilon_{it} \quad ....(7)$$

for I = 1.........N; t=1........T ; m=1... M

where N refers to the numbers of states in the panel, T refers to the number of observation over time; M is the number of exogenous variables. The structure of estimates residuals is as follows:

$$\acute{\varepsilon}_{it} = \rho i\, \acute{\varepsilon}_{it-1} + \acute{v}_{it} \quad ....(8)$$

The null hypothesis is stated as no cointegration and it uses the residuals derived from the panel analogue of an Engle & Granger (1987) static regression to construct the test statistic and tabulate the distributions. In the face of conflicting results, Pedroni shows that the group-adf statistic and panel-adf statistic generally perform best. The result of the Pedroni test was also compared with the result of the Kao Residual Cointegration Test.

Error Correction Model: According to Engle & Granger (1987) when the series x and y are cointegrated a standard error correction model is imperative. This will account for the speed of adjustment in the long-run and short-run dynamics of the model. For our study, the presence of

cointegration among the variables required us building an error correction model to look at the link between the short-run and the long-run effect. It is given as

$$POVit = \gamma_0 + \gamma_1 \sum_{j=1}^{n} yi_{t-j} + \gamma_2 \sum_{j=1}^{n} ineqi_{t-j} + \beta_1 eit - j + \mu t \dots\dots\dots\dots\dots\dots\dots(9)$$

The coefficients γ_1 and γ_2 captured the short-run effect, while β_1 give the adjustment rate at which short-run dynamics converge to the long-run equilibrium relationship. If β_1 is negative and significant it means a long-run relationship exist between y (dependent variable) and *X* (independent variables). This required a two-step procedure; first the error correction term is obtained by saving the residuals of the estimation of the long-run equilibrium, and then the model is estimated again with the residual.

Model justification

When panel data set are used, unobserved effects model can help to isolate the effects of group (state) specific time-invariant characteristics such as natural geographic potential, infrastructural service levels and many more. Panel data models can be used to increase the degrees of freedom, given the range of variables, and generalize results across cross-sectional units particularly when the time series are short as in our case. Panel data causality reduces the number of observations as compared to annual series; do not suffer from the cyclical influence and noise as in annual data making it difficult to identify the specific relationships.

EMPIRICAL ANALYSIS

Correlation

Table 1 present the Pearson correlation coefficients for the variables used in the model and show I the degree of multi-collinearity between the variables. Growth had a negative correlation with poverty and inequality. The correlation between growth and inequality indicated that growth benefited the poor more than the not-so-poor. It further showed that the impact of growth on poverty reduction was high. Poverty was seen to be positively correlated with inequality. This indicated that poverty increased with increase in inequality. The negative correlation between growth and poverty on the one hand and the positive correlation between inequality and poverty on the other hand confirmed that in Nigeria, higher average growth and lower inequality were associated with lower poverty. However, correlation is not causality. Hence the needs to further investigate the flow of causality among the variables.

Table 1: Correlation matrix

Correlation coefficients, using the observations 1:1 - 37:5
5% critical value (two-tailed) = 0.1443 for n = 185

Pov	Ineq	l_rY	
1.0000	0.1031	-0.1925	pov
	1.0000	-0.1751	Ineq
		1.0000	l_rY

Unit root test

The result of the Maddala & Wu (1999) unit root tests for poverty, growth and inequality is presented in Table 2. The result shows that all the variables were non-stationary in levels across states as the tests do not reject the null hypothesis of non-stationarity. The three variables were found to be $I(1)$ at 5% level

Table 2: Unit-Root Tests using Maddala Wu techniques

Variable name	Maddala Wu (ADF-Fisher Chi^2)		Order of integration
	Levels	**1st difference**	
Poverty (pov)	35.432(1.000)	290.843 (0.000)	**I(1)**
Growth (RY)	59.6587(0.887)	80.2187(0.029)	**I(1)**
Inequality (INEQ)	48.8845(0.989)	314.764(0.000)	**I(1)**

T-bar critical values; 1%= 5.52682; 5% = 5.85222; 10%= 6.03304 (Probabilities in parentheses) Sample from 1985-2010 using five years panel
Source: Author's computation using data sourced

Cointegration test

Since the variables were I(1), we conducted cointegration tests to examine the presence of a stable long-run relationship among growth poverty and inequality. Table 3a present the results of Pedroni's panel cointegration tests. The majority of the statistics (five out of seven) have low values of probability with different signs and so we fail to accept the null hypothesis that there is no cointegration among the variables across the states. The null of no cointegration was rejected by the panel pp statistic, the panel adf statistic, group rho statistics, group pp and the group adf statistic. Also, the result of the Kao cointegration test failed to accept the null hypothesis of no

cointegration as seen in Table 3b below. Thus, the cointegration tests support the existence of a long-run relationship among the variables across the states.

Table 3a: Panel cointegration test results. Pedroni panel cointegration test (Null Hypothesis: No cointegration)

Non parametric (within-dimension)	
Panel v statistic	-0.8348 (0.7981)
Panel p statistic	0.9441 (0.8274)
Panel pp statistic	-3.4611 (0.0003)
Panel adf statistic	-1.9126 (0.0279)
Parametric (between-dimension)	
Group p statistic	4.5521 (0.0498)
Group pp statistic	-8.1245 (0.0000)
Group adf statistic	-5.0209 (0.0000)

Sample from 1985-2010 using five years panel
Source: Author's computation using data sourced

Table 3b: Kao Residual Cointegration Test
POV RY INEQ (**Sample from 1985-2010 using five years panel)**
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-8.026389	0.0000
Residual variance	291.0227	
HAC variance	244.1104	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-1.584695	0.112228	-14.12037	0.0000
D(RESID(-1))	0.389001	0.080533	4.830342	0.0000

Source: Author's computation using data sourced

Error correction

Since the result of the cointegration indicates the existence of a long-run relationship among the variables, we carried out an error-correction estimate using fixed effect model. The result presented in Table 5a show that while inequality had a positive relationship with poverty, growth had a negative relationship across the states. The result further shows that only inequality is statistically significant at 5 per cent level. The result indicates that a percentage change in growth leads to about 87 percent reduction in poverty while a unit change in inequality leads to about 83 unit increase in poverty level in the long run. This is an indication that poverty in Nigeria is economically linked with inequality. This result thus supports the classical theory that there is a positive relationship between growth and inequality and increase in inequality increases poverty given the positive relationship between poverty and inequality. The major cause of poverty in Nigeria is the poor distribution of proceed from growth. This thus contradicts the classicalist theory that inequality is healthy for the development of the economy through the growth impact of savings and investment from the rich class of the economy.

The negative relationship between growth and poverty reveals that the growth rate has the potential of reducing poverty in the country. Although, this was not significant because majority of the population are in agricultural sector and this sector has been found to be affected by poverty mostly in the country. The high growth rate recorded in the country is mainly attributed to the oil sector that has only a small proportion of the population. Hence the growth could not significantly reduce poverty in Nigeria for the period of study. The result of the relationship between poverty and growth is however contrary to the findings of some studies (e,g Bello & Roslan, 2010). The result of the short-run analysis also showed that growth had an insignificant negative relationship with poverty and inequality had a significant positive relationship. The coefficient of the error term is negative and statistically significant. The result showed that 98 per cent of the error in the previous times disequilibrium is corrected. This is a reasonably high, indicating the strength of the long-run relationship.

Table 4a: Error Correction Estimate

	Long-run Analysis Dependent variable= (POV$_{it}$)			
Explanatory variables	**Coef**	**Robust S.E**	**Z-sat**	**P**
L_ry$_{it}$	-0.87486	0.986589	-0.8868	0.37667
Ineq$_{it}$	82.9668	26.7275	3.1042	0.00229
Intercept	25.1413	13.7571	1.8275	0.06966
R^2 R^2 (Adj) F (sat) F (pro) DW	0.460036 0.319497 3.273373 0.000016 1.657147			

Source: Author's computation using data sourced

Table 4b: Error Correction Estimate

	Short-run Analysis Dependent variable= (D_POV$_{it}$)			
Explanatory variables	**Coef**	**Robust S.E**	**Z-sat**	**P**
D_L_ry$_{it}$	-0.862897	1.11185	-0.7761	0.43939
D_Ineq$_{it}$	119.339	11.765	10.1436	0.00001
et_1	-0.982697	0.0962256	-10.2124	0.00001
Intercept	5.75824	4.83418	1.1911	0.23621
R^2 R^2 (Adj)	0.653964 0.529006			

F (sat)	5.233490			
F (pro)	0.00000			
DW	1.870130			

Source: Author's computation using data sourced

Granger causality

Using the VECM Granger test of causality, the result as presented in Table 5a and 5b shows that there is short-run uni-directional causality between poverty and inequality with inequality causing poverty while there is no evidence of causality between growth and poverty. The result of the Wald statistics also proves same as presented in Table 5B below. The result also showed a long-run causality in growth and inequality given the significance of the error term while there is no long-run causality in poverty. The speed of adjustments are 0.021, -0.0003 and -0.298 for poverty, inequality and growth respectively. The result shows that while growth in the country is widening the inequality in the country, the inequality gaps created are also helping the increase in growth. The result of the causal relationship of poverty with growth and inequality significantly showed that the major cause of the rising incidence of poverty in the country is as a result of the high level of inequality in the distribution of resources. The result is in tandem with the findings of some other studies such as N'zue & N'guessan (2006), on causality between poverty growth and corruption in a panel study of 18 African countries. The study of Gries & Redlin (2010) showed positive bidirectional causality between growth and inequality as well as between inequality and poverty, while contrary to our findings negative bidirectional causality between growth and poverty. Thus, the causality among poverty growth and inequality flows from the high and increasing growth causes increase in inequality and inequality causing poverty.

Table 5a: Granger Causality t-Tests

	Δry	Δineq	Δpov
Δry(-1)	0.125399 (1.33826)	-0.000131 (-2.08807)*	-0.001412 (-0.07958)
Δry(-2)	-0.091015 (-1.19754)	-0.000151 (-2.96747)**	0.01374 (0.95506)
Δineq(-1)	-1169.272 (-3.24637)**	0.037039 (0.15361)	-33.32279 (-0.48875)
Δineq(-2)	-1069.441** (-3.50753)	0.076500 (0.37478)	41.45105 (2.33975)**
Δpov(-1)	-0.510124	-2.75E-0.5	-0.500466

	(-0.86750)	(-0.06980)	(-4.49602)**
Δpov(-2)	-0.755761 (-1.26437)	0.000510 (1.27374)	-0.380059 (-3.35892)**
ECM	-0.297721 (-3.48316)**	-0.000252 -4.40386**	0.021396 (1.32236)

Note: The reported values in parentheses are the t-values of the test; ** indicates significant at 5%

Source: Author's computation using data sourced

Table 5b: Granger causality Wald statistics

VEC Granger Causality/Block Exogeneity Wald Tests
Dependent variable: D(RY)

Excluded	Chi-sq	Df	Prob.
D(INEQ)	12.74010**	2	0.0017
D(POV)	1.744027	2	0.4181
All	17.27529**	4	0.0017

Dependent variable: D(INEQ)

Excluded	Chi-sq	Df	Prob.
D(RY)	9.136269**	2	0.0104
D(POV)	2.046450	2	0.3594
All	10.41855**	4	0.0339

Dependent variable: D(POV)

Excluded	Chi-sq	Df	Prob.
D(RY)	1.414114	2	0.4931
D(INEQ)	3.989320**	2	0.0461

Note: ** indicates significant at 5%
Source: Author's computation using data sourced

CONCLUSION AND POLICY RECOMMENDATIONS

This study was carried out using the 1985 through to 2010 surveys (1985, 1992, 1996, 2004 and 2010) conducted in the Nigeria. The study found that poverty is mainly attributed to the unequal distribution of resources. Although growth was found to have the potential of reducing poverty in the country, its effect is not significant as a result of the nature of growth in the country. The recorded growth is highly attributed to one sector which has only small proportion of the population. A large proportion of the population are found in the agricultural sector which has the bulk of the labour force hence it is not surprising that the recorded growth over the period for the study could not help in the reduction of the incidence of poverty in the county. The study further found the existence of a causal link among poverty growth and inequality in Nigeria. Growth was found to cause inequality as well as inequality causing growth. Poverty was found to be caused by inequality. Thus it was found that the high rate of growth in the country which is concentrated in only few sectors that has a small proportion of the population has led to the high level of inequality and this has led to the rising incidence of poverty.

From the above findings, it is clear that the linking factor in the triangle is the level of inequality in the distribution of resources. In this regard, policies on the distribution of resources and growth proceeds should consider regional and sectorial diversity with emphasis on those states that have high prevalence of poverty. Lowering the high rate of inequality is also important for the reduction of poverty. Such policies as long-term strategic plans on human capital development through education and health facilities are imperative. Employment is another important outcome of any welfare intervention and inequality reduction. This can be achieved through the creation of more jobs and providing conducive environment for the private sectors to create more jobs. Furthermore, cash transfer programs to low-income families and improved taxation policies should be applied for effective reduction of poverty.

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